



PATENT APPLICATION

AF #1732  
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March 21, 2003

John C. Hammar

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: D. Engwall *et al.*

Examiner: S. Staicovici

Appl. No.: 09/407,278

Art Unit: 1732

Filing Date: September 29, 1999

Docket: 96-234C

March 21, 2003

For: *Method for Making a Composite*

Assistant Commissioner for Patents

Attention: Board of Patent Appeals and Interferences

Washington, DC 20231

BRIEF ON APPEAL

Sir:

Applicant files three copies of this Brief on Appeal within two months following filing a Notice of Appeal on January 21, 2003. Please charge the fee of \$320.00 under 37 C.F.R. §1.17(f) to Deposit Account No. 02-2960. If Applicant owes any other fee (including any fees under §1.17 or all required extension of time fees), please charge that fee to Deposit Account 02-2960. Please treat this paper (and any future reply) as incorporating a petition for extension of time for the appropriate length of time, in the event that an extension is required.

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is The Boeing Company.

II. RELATED APPEALS AND INTERFERENCES

Applicant does not know of any other appeals or interferences that directly affect or will be directly affected by the Board's decision in this appeal.

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### III. STATUS OF CLAIMS

1. Claims pending: 17, 18, 28, 29 and 32 - 35
2. Claims canceled: None
3. Claims withdrawn from consideration but not canceled: 29 and 32 - 35
4. Claims allowed: None
5. Claims rejected: 17, 18 and 28
6. Claims on appeal: 17, 18 and 28

### IV. STATUS OF AMENDMENTS

Applicant filed an Amendment After Final Rejection on December 20, 2002, which was not entered. A provisional Terminal Disclaimer, however, was entered.

### V. SUMMARY OF INVENTION

The present invention relates to an improved process of fabricating tools for manufacturing composite parts from constituent elements, such as face skins or laminates, honeycomb core and resin preimpregnated fabric, that produces parts having greatly improved conformance to dimensional requirements. The hybrid tool and a process allows the constituent elements to be assembled, bonded and/or cured, and then machined, i.e. sculpted, trimmed and/or drilled, with great precision, all while on the hybrid tool in the original position. Only after all the manufacturing steps are the complete parts removed from the tool. The present invention also relates to an improved part that is assembled, cured, and machined on that same tool in the original position, having improved conformance to the dimensional requirements. The preferred parts are large segments of the nacelles of commercial transport aircraft, perhaps 20 feet long and 8 feet in diameter.

These features of the invention are attained in a hybrid tool which serves both as a form on which constituent materials are applied for bonding or curing into a part in a desired configuration, and for holding the bonded or cured materials in the originally applied position during subsequent machining of a peripheral edge of the part by a CNC machine tool while the lay-up tool is positioned on a bed of the machine tool. In the hybrid tool, the face sheet is made of composite material and is configured to a desired shape corresponding to one surface of the part to be made on the tool. The face sheet has reference plane whose orientation and height above the machine tool bed are specified in the part program. A substantially continuous groove in the face sheet of the hybrid tool opens in the facing surface. A base structure supports the face sheet to maintain the facing surface in the desired shape. The base structure has ground-engaging pads, each having a contact surface, together defining an "A" datum plane, by which the

supporting structure contacts and is supported by the machine tool bed. Attachments on the face sheet support the face Sheraton the supporting structure with the reference plane of the face sheet parallel to the "A" datum plane. The materials for the part are applied on the face sheet, are bonded or cured, and edge trimmed thereon, all while on the face sheet in the originally applied position. The edge trimming is performed by a CNC machine tool following a part program to move a cutter extending into the groove to engage the full thickness of the part. The groove corresponds in space to the position represented by the cutter path of travel in the part program by virtue of accurate relationship of the face sheet reference plane and the "A" datum plane.

## VI. ISSUES

Claims 17, 18 and 28 are rejected under 35 U.S.C. § 103(a) as being unpatentable over US Patent 5,746,553 (*Engwall*) in view of US Patent 4,937,768 (*Carver*).

## VII. GROUPING OF CLAIMS

Each claim stands separately; arguments for the patentability of each claim appear in the Argument section.

## VIII. ARGUMENT

*Engwall* describes a tool that was a predecessor to that tool described and claimed in the present application. That tool uses an Invar metal forming surface, so *Engwall* fails to teach or to suggest a tool having a composite material as the mold surface. As suggested in the present specification, the present invention eliminates the need for costly tooling by using a master mold to make composite molding surfaces rather than Invar face sheets. Hybrid tools are much easier to make, much cheaper to make, much easier to change, and able to produce as high a quality part as was made with the "dual purpose tools" that *Engwall* describes.

*Carver* fails to cure the deficiencies of *Engwall*. *Carver* describes an integrated assembly system using a master definition of the article being formed as a graphic data set in a 3-D graphics computer system. The data set includes coordinate points precisely locating the design definition.

*Engwall* is not properly applied as a reference. The present application is a CIP of *Engwall*. Apart from that CIP status, the present application claims the benefit of US Provisional

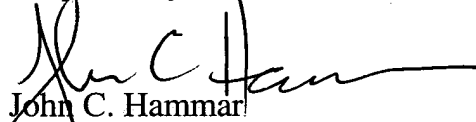
Patent Application 60/045,742, filed May 6, 1997. *Engwall* did not issue until May 5, 1998.

While *Engwall* was filed on April 6, 1996, it and the present application are commonly assigned to The Boeing Company. Accordingly, *Engwall* does not qualify as a reference.

The Examiner asserts that the present application, a divisional based upon 09/072,716, now US Patent 6,012,883, was filed after *Engwall* issued, and, therefore, cannot claim priority from it. Applicant has established a chain of priority through cases that were copending, and, accordingly, can claim priority from *Engwall* itself through the 09/072,716 application and its provisional 60/045,742. Applicants will submit a supplemental declaration separately to satisfy requirements that the Examiner has raised concerning that requirement.

Claim 17 requires a hybrid tool having a face sheet made from composite material. Claim 18 identifies that the face sheet is made from graphite/bismaleimide. Claim 28 also requires that the hybrid tool have a face sheet made from a composite material made on a master tool. Neither *Engwall* nor *Carver* teach or suggest such a tool or its use in the defined method. Please reconsider the rejection based on obviousness both because *Engwall* is not a reference and, even if it is, the cited references do not render the claimed methods obvious.

Respectfully submitted,



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IX. APPENDIX



*The appealed claims are:*

17. A method of manufacturing a composite part on a hybrid tool, comprising:  
coating a face sheet of a hybrid tool with a release agent, said face sheet made from a composite material made on a master tool, the composite material having a mold surface the same shape and size as a surface of said part;

laying up plies of resin impregnated fabric material on said face sheet to a desired thickness;

debulking said plies in a vacuum bag with gas pressure, and curing said resin to form said part on said face sheet;

placing said hybrid tool on a machine tool bed at a position designated in a machine tool program using positioning devices;

probing reference features on said hybrid tool to accurately establish the position of said face sheet relative to a home position of the machine tool, said reference features having been transferred from corresponding reference features on said master tool;

normalizing said machine tool part program to correspond to the actual position of the hybrid tool on the machine tool bed as determined by said probing of said hybrid tool reference features;

operating the machine tool to rotate a cutting tool while following a cutting path along and within a groove in said face sheet so that said cutting tool projects into said groove and engages the full thickness of said laid-up part on said hybrid tool face sheet for peripheral edge trimming of the part; and

removing the trimmed part from the mold surface.

18. A method of manufacturing a composite part on a hybrid tool as defined in claim 17, wherein:

said face sheet of said hybrid tool is made of graphite/bismaleimide.

28. A method of making a composite part on a hybrid tool:

coating a face sheet of a hybrid tool with a release agent, the face sheet made from a composite material made on a master tool, the composite material having a mold surface the same shape and size as a surface of the part;

laying up plies of resin impregnated fabric material on the face sheet to the desired thickness;

debulking the plies in a vacuum bag with gas pressure, and curing the resin to form the part on the face sheet;

placing the hybrid tool on a machine tool bed at a position designated in a machine tool program using spud and sine key;

probing reference features on the hybrid tool to accurately establish the position of the face sheet relative to a home position of the machine tool the reference features having been transferred from corresponding reference features on the master tool;

normalizing the machine tool part program to correspond to the actual position of the hybrid tool on the machine tool bed;

operating the machine tool to rotate a cutting tool while following a cutting path along and within a groove previously cut into said face sheet so that said cutting tool projects into said groove and engages the full thickness of the laid-up part in the tool face sheet for peripheral edge trimming of the part.